

5-1 I 5231.1831

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY

FOREST INSECT INVESTIGATIONS

REPORT OF THE 1929 SURVEY OF THE MOUNTAIN PINE BEETLE
INFESTATION IN THE BIG HOLE BASIN

By
A. L. Gibson
Assistant Entomologist

Forest Insect Field Station
Coeur d'Alene, Idaho
January 28, 1930

REPORT OF THE 1929 SURVEY OF THE MOUNTAIN PINE BEETLE
INFESTATION IN THE BIG HOLE BASIN

Respectfully Submitted

A. L. Gibson

A. L. Gibson
Assistant Entomologist

Forest Insect Field Station
Coeur d'Alene, Idaho
January 28, 1930

REPORT OF THE 1929 SURVEY OF THE MOUNTAIN PINE
BEETLE INFESTATION IN THE BIG HOLE BASIN

Contents

	<u>Page</u>
INTRODUCTION - - - - -	1
Survey Method - - - - -	1
HISTORY OF THE INFESTATION AND OF CONTROL WORK IN THE BIG HOLE AREA - - - - -	2
Development of the Infestation in Each Unit - - - - -	3
Development of the General Infestation - - - - -	12
THE 1929 SURVEY - - - - -	13
SUMMARY - - - - -	17
LIST OF REFERENCES	18
GRAPH	

REPORT OF THE 1929 SURVEY OF THE MOUNTAIN PINE BEETLE INFESTATION IN THE BIG HOLE BASIN

INTRODUCTION

This report aims to show the status of the infestation in the Big Hole Basin and the country adjoining it on the south from the time surveys were initiated on the entire area in 1927 up to and including the 1929 season. The purpose of this survey has changed since the 1928 season. Prior to that time the object had been to secure the general location and number of infested trees on each unit as a preliminary to planning control. With the tremendous increase in the number of infested trees in 1928 and the cessation of control work, the original need for the survey was no longer present. Information was meager, however, on the advance and development of infestations, so it was decided to continue the annual survey for a number of years as a study project. The 1929 reconnaissance, while conducted with a different objective in mind, was made with no alteration in method.

Survey Method

The survey method employed required each man to run a strip one chain wide on which the attacked trees were recorded for each ten chains of distance travelled. The strips being paced on a compass bearing made it comparatively easy to plot the data on large-scale maps. From the proportion that these strips and the infested trees they contained were to the area concerned, the number of infested trees on the entire unit was secured.

HISTORY OF THE INFESTATION AND OF CONTROL WORK IN THE BIG HOLE AREA

An extensive survey in 1925 seemed to show that the mountain pine beetle infestation in the northwest part of the Big Hole Basin originated from insects that flew over the Continental Divide.

Control work was instituted in 1926 and 5,271 trees were treated in the Big Hole and 1,204 on the adjoining Bitterroot drainage. A big increase in the infestation in the Big Hole in 1926, probably caused chiefly by a heavy flight of beetles from the Bitterroot infestation, made it necessary to concentrate all available funds on that area in 1927. During that season, on the north and west sides of the Basin from the boundary of the Deerlodge-Beaverhead Forests west and south to the Battlefield, 17,546 infested trees were treated. To facilitate administration the treated area and later the entire Basin were divided into units, each usually including the more heavily timbered part of the watershed of one or more of the larger streams.

An insect reconnaissance made during the fall of 1927 showed that the insects, besides becoming established in even greater numbers in the units in which control work had been instituted, had spread to the east side of the Basin and into the Fish Trap-Rise River section. In 1928 about 55,000 of the 81,000 trees found on these units were treated. A reconnaissance subsequent to control work in 1928 showed about 100,000 trees had been infested in 1927, of which about 55,000 had been treated.

The 1928 survey showed that the infestation in the Basin had increased to approximately 250,000 trees attacked. With only about 46,000 1927 attacked trees left in the Basin following control, an increase to 250,000 in 1928 could hardly be credited entirely to building up of the infestation present in the Basin. Part of the increase must have been due to invading insects from both the Bitterroot and Idaho infestations.

The 1929 survey indicated 1,109,833 infested trees to be present in the Big Hole Basin. Table I shows the increase in the number of infested trees from 1927 up to and including the 1929 season.

Development of the Infestation in Each Unit

In discussing the status of the infestation on the various units mention will frequently be made of the Bitterroot infestation as one of the sources of insects which are invading the Big Hole Basin. The invasion of the Big Hole Basin by beetles from the Bitterroot infestation is facilitated by topography and timber types. The Continental Divide from the western edge of the Pintlar unit southwest and south to the West Side unit is low and covered with white-bark pine and lodgepole pine. This gives practically a continuous belt of timber from the Bitterroot River well into the Big Hole Basin, a route which many of the insects seem to be following in their spread. The concentration of infestation in the Bitterroot is very heavy at the head of Swift, Meadow, and Tolan Creeks and is becoming quite heavy at the head of Camp Creek.

Table I

Summary Sheet - Big Hole Survey - 1929

Name of Unit	Acreage of Unit	Total Number of Infested Trees			Attacked Trees per Acre			Per Cent of Increases in Number of Attacks over Previous Year #	
		1927	1928	1929	1927	1928	1929	1928	1929
Pintler	21,760	5,440*	18,278	113,825	0.250*	0.839	5.231	236	523
Mussiebrod	20,480	7,168*	43,827	123,182	0.350*	2.139	6.014	511	181
Battlefield	37,120	3,712*	28,582	166,280	0.100*	0.769	4.480	669	482
West Side	33,280	1,996*	22,297	149,345	0.060*	0.669	4.488	1017	570
Jackson	28,160	3,097	24,217	116,588	0.110	0.859	4.140	682	381
Bloody Dick	61,440	6,144	29,491	94,895	0.100	0.479	1.545	380	220
Horse Prairie	24,320	5,836	11,673	64,323	0.240	0.479	2.045	100	451
Rattlesnake	48,000	--	2,592	10,347	--	0.054	0.215	2592	299
Grasshopper	41,600	540	540	3,224	0.013	0.013	0.077	--	497
Warm Springs	51,200	1,024	18,944	61,551	0.200	0.370	1.593	1750	325
East Side	49,280	8,870*	32,524	142,320	0.180*	0.659	2.890	266	338
Upper Wise River	144,000	2,160	9,504	16,929	0.015	0.066	0.118	340	78
Lower Wise River	61,440	614*	6,328	27,024	0.010	0.103	0.440	931	327
Averages or Totals 622,080		46,601*	248,797	1,109,833	0.075	0.400	2.566	474 = Av. per cent increase over 1927	346 = Av. per cent in- crease over 1928

No comparison is given prior to 1928 as no general survey had been made before that time.

* Trees left on area covered by control.

Another infested area of increasing menace to the Big Hole timber is in Idaho to the west and southwest of the Big Hole units. This infestation which is present in the lodgepole pine stands on the Idaho side of the Continental Divide is increasing quite rapidly. Concentration of insect work seems especially heavy in the drainages of Wimpey and Pratt Creeks, adjacent to the Jackson unit. Two heavy centers of infestation are also developing on the headwaters of the North Fork of the Salmon River adjacent to the Battlefield unit. It is not known if these two areas had their origin in insects from the Bitterroot or the Idaho infestations, but in any case it is quite possible they have already grown to the point where they are contributing an increasing number of insects each year to the Big Hole epidemic. Flight of insects from any of the Idaho groups is probably favored by the prevailing southwest winds and many low timbered passes. Another heavily attacked area in Idaho adjoins the western section of the Horse Prairie unit. It is believed the three main areas in Idaho just discussed are contributing more beetles each year to the Big Hole outbreak, and that they are supplemented or even exceeded in numbers by insects which fly from across the Lemhi and Salmon Rivers.

The unknown number of beetles flying into the Big Hole area makes any attempt to determine the benefits secured from the 1928 control work practically valueless. For that reason no attempt will be made to present such figures but a discussion of the source of infestation will

be given for each unit. The discussion can be most easily followed by considering the units in the order shown in Table I and the appended graph.

In discussing the units it should be pointed out that the acreages and boundaries as given in the "Final Report of the 1928 Survey of the Big Hole Basin Insect Control Project" have been continued in this report. This has been done to favor more ready comparison of each year's data and in the belief that the limited areas designated for some of the units are sufficiently large and otherwise satisfactory for the purpose of the study.

Pintlar unit shows the infestation in 1928 to have only slightly exceeded the number attacked in 1927. There are believed to be two possible sources of infestation on this unit; insects already present on the area, and others flying in from the Bitterroot infestation to the north and west. It is believed the insect flight into this area in 1928 was comparatively light because there were only 18,250 infested trees that year, and 5,500 had been left from the previous year's attack. This increase from 5,500 trees of the 1927 attack to 18,250 for 1928 is very slight compared with the increase to 113,825 in 1929. There is little doubt but that much of this 1929 increase was due to a heavy drift of beetles from the Bitterroot and possibly some from the adjacent Mussigbrod unit in 1929.

The Mussigbrod unit showed a much greater increase of infestation in 1928 than the adjacent Pintlar unit. It is believed that the presence of more than double the number of attacked trees in 1928 over

1927 is largely due to drift of the beetles from the Bitterroot infestation. The outbreak on the Mussigbrod unit showed a much greater increase in 1928 than did the Pintlar unit. It is believed the presence of more than double the number of attacked trees on the Mussigbrod unit in 1928 over 1927 was also largely due to drift of beetles from the Bitterroot infestation. As the Bitterroot infestation becomes heavier along the Continental Divide there will probably be an increasing number of insects flying into the Big Hole. This increasing flight, if it has not already reached a maximum on the area adjoining the Mussigbrod unit, should reach its peak in a year or two and begin to show a decrease shortly afterward. The epidemic and resulting overflow of beetles into the Big Hole should reach its peak on the area adjoining the Battlefield unit, at its northern end, one or two years later than on the area adjacent to the Mussigbrod unit. It is believed this peak of increase will follow the Continental Divide southward for a number of years with a resultant heavy and persistent influx of beetles into the Battlefield unit. By the time the main body of the Bitterroot infestation has reached the southern end of the Battlefield unit, and possibly even before that time, it is believed the Salmon and Bitterroot infestations will be so intermingled as to make it impossible to distinguish between them.

That the heavy front of the Bitterroot infestation centered along the northern edge of the Mussigbrod unit must have resulted in considerable overflow of the insects into that unit is indicated by studies carried on in the Bitterroot and Big Hole Basin during the period from 1925 to 1929.

These studies indicate that the number of insects emerging from infested trees do not exceed the number attacking sufficiently to greatly increase the number of trees killed each year. Any great increase in infested trees indicates the probability of another source. That a heavy overflow of insects from the Bitterroot was probably repeated in 1929 is shown by the nearly 200 per cent increase recorded for that year. The moderate increases suggested apply only to the long established Bitterroot infestation and are not meant to apply to infestations in other localities.

The Battlefield unit presents much the same condition as the preceding two. The increase in both 1928 and 1929 can hardly be accounted for by building up of the outbreak already present on the unit but must have been greatly reinforced by drift from the Bitterroot infestation. A very heavy front of the Bitterroot infestation is now present at the head of Tie and Trail Creeks and to a lesser extent at the head of Camp Creek. Flight of beetles from these areas into the Battlefield unit has undoubtedly been heavy. As the discussion of the outbreaks given in the preceding paragraph indicates, the Battlefield unit is likely to be subjected to a constant influx of beetles for a number of years from the Bitterroot infestation. It is also probable that the drift from the Idaho infestation will increase and that a fusing of the advance groups of the two infestations will occur on this unit.

The West Side unit shows with a fair degree of certainty that increase was due to other than local building up of the epidemic. The 1928 increase over the previous year's was about 1,000 per cent and that of 1929 over 1928 nearly 600 per cent. As has been previously pointed out, such

large increases can not be credited entirely to local development but must be largely due to migration into the unit of insects from both the Bitterroot and Idaho infestations supplemented by the local increase.

The Jackson unit is believed to have received comparatively few beetles from the Bitterroot outbreak. The heavy infestations in Idaho at the head of Wimpsey and Pratt Creeks and still further west and southwest across the Lemhi and Salmon Rivers are probably responsible for most of the nearly 700 per cent increase in 1928 and the nearly 400 per cent increase in 1929, with local growth accounting for but a small proportion of it.

All the insects invading the Bloody Dick unit are believed to have come from the Idaho infestation. This unit shows the lightest infestation of any of the units on the west side of the Big Hole project up to the present time.

Insects migrating from infested areas in Idaho were the probable source and the increasing supply of the infestation on the Horse Prairie unit. Evidence that these insects came from Idaho seems to be strengthened by the limitation of the infestation to the western section of this unit. The eastern section has no insect work while the western section is heavily infested and adjoins an even more heavily infested stand in Idaho.

The Rattlesnake unit showed considerable increase from the 1925 to the 1929 season. Indications are that the infestation now present had its inception in beetles that flew into the area in 1927. Idaho seems the logical source of the insects even though the Bitterroot infestation is no more distant. A number of factors contribute to this belief. Between

the Idaho outbreak and this unit there is less timber to attract the insects and more open country which it is believed would force the insects to remain in flight a longer time in their endeavor to reach timber. In bridging such a large area the beetles would be favored by prevailing southwest winds. On the other hand, insects from the Bitterroot infestation would have to fly southeast. Flight in that direction is thought to be generally hindered by the prevailing southwest winds, but it is possible that insect flight may have occurred at a time when the wind was blowing from either the northwest or north. An additional possibility is that the insects, flying high, may have found favorable air currents at a higher elevation in which they stayed long enough to be carried well to the southeast, or south before dropping to the ground. Another factor of which very little is known is the flying ability of the insect. It may be capable of fairly swift and sustained flight even against the wind. For these reasons it is inadvisable to state that a certain area is either immune or even unlikely to be infested from a certain source because prevailing winds blow from the area in question toward the source of the insects. However, with sources of infestation equidistant from an area, the possibilities are much greater that infestation came from the direction in which the prevailing winds were blowing.

Although apparently in a more favorable position than the Rattlesnake unit to attack by insects either from the Bitterroot or Idaho outbreaks, Grasshopper unit is the most lightly infested of any of the areas.

Probably the Bloody Nick, Jackson, and adjacent Warm Springs units attracted most of the insects that would otherwise have settled in the Grasshopper unit. It is believed that the infestation present is due to insects which have entered from Idaho, the initial flight occurring in 1927.

The first red-top trees noted on the Warm Springs unit were of the 1926 attack. The fairly heavy infestation which has built up since that time probably began from a flight of beetles from Idaho. It is possible that some beetles may have flown in from the Bitterroot infestation since that time, but it is believed the greater part of them are coming from Idaho.

The East Side unit, with the heaviest infestation on the eastern part of the project, showed no red-top trees in 1926, but there is little doubt that heavy flights of beetles from the Bitterroot and Idaho have occurred since then, judging from the rapid growth of the infestation which began in 1926. It is thought the East Side unit was infested on the north end by insects from the Bitterroot and that Idaho was the source of those infesting the south end.

Upper Wise River, with a mountain barrier between it and the main sources of infestation, has shown only a comparatively moderate increase in infestation, which likely had its origin in insects from both the Bitterroot and Idaho. It is feared this mountain barrier will become less effective as the epidemic increases on the adjacent Warm Springs and East Side units. It is believed insect work on these units will soon reach the stage where food competition will begin and induce migration

from them in increasing numbers. Also, many beetles flying from the epidemics to the west and north will be forced to continue their flight because of lack of food on the East Side and Warm Springs units. Prevailing southwest winds are likely to force many of these beetles over the mountains into the Wise River units.

Provided this forecast of insect spread proves correct the comparative immunity which the Upper Wise River unit has enjoyed will soon cease and rapid increases in infestation can be expected in succeeding years.

The Lower Wise River unit occupies somewhat the same position as the Upper Wise River unit. It is, however, likely to receive a greater proportion of insects directly from or having their origin in the Bitterroot infestation and proportionately fewer, if any, from Idaho sources. The northern part of the East Side, Pindlar, and the Mussigbrod units are the most likely sources of any migrating beetles.

Development of the General Infestation

The increase in the outbreak in the Big Hole from 1927 to 1928 was 434 per cent and from 1928 to 1929 amounted to 346 per cent. A comparison of these two per cent increases might indicate from the smaller one, for 1929, that the infestation was beginning to decline. Such is not the case, however, as shown by the following explanations. Control work in 1928 had resulted in 55,000 of the 1927 attacked trees being treated. This left only 46,000 of the original 101,000 trees, to serve as a potential source of the 1928 infestation. This reduction to 46,000 made the per cent of increase, but not the actual number of trees subsequently attacked, very high. Studies made in the Bitterroot indicate that insects emerging each year could hardly cause the outbreak to increase as much as 100 per cent. Assuming that the data secured from these studies is applicable to the Big Hole and that the increase in

infested trees amounted to 100 per cent, the 46,000 trees not treated would have liberated only enough insects to attack 92,000 trees and any excess must be due to beetles that flew into the area. As there were 248,000 trees attacked and only 92,000 could be accredited to local increase, the difference, which amounted to 156,000 trees, should be considered due to invading beetles. On the other hand, still assuming that the Bitterroot data would apply, if none of the original 101,000 trees had been treated they would have caused the attack of not more than 202,000 trees the following year. There is no reason to believe that the number of trees attacked by invading beetles would have been appreciably affected, whether control work was instituted or not. Therefore, to the 202,000 trees which it is presumed would have been attacked by local increase must be added 156,000 trees attacked by invading insects, bringing the total to 358,000. Still assuming no control work the estimated increase from 101,000 in 1927 to 358,000 in 1928 would have amounted to 25 $\frac{1}{4}$ per cent. Actually, the increase from 46,000 to 248,000 infested trees amounted to 43 $\frac{1}{4}$ per cent. Comparing the actual 43 $\frac{1}{4}$ per cent with the probable 25 $\frac{1}{4}$ per cent increase, indicates how control raised the per cent, but not the actual number, of attacked trees in 1928. The comparison also shows, assuming that the figures given for the probable increase had no control been instituted are reasonably correct, that the 1929 increase of 346 per cent was considerably more than the 25 $\frac{1}{4}$ per cent estimated for 1928, and that any impression that the infestation might be declining is not only incorrect but that the outbreak is really increasing. In 1929 the number of infested trees rose to 1,109,803 from 248,797 for the previous year. This increase, amounting to about 860,000 trees, is more than four times the approximate increase of 1928.

It is thought that approximately 60 per cent of the 1928 and 1929 infestations had their source in insects from the Bitterroot epidemic. These figures are merely an estimate of the amount and probable source of the epidemic on each unit.

THE 1929 SURVEY

Notes and Recommendations from the 1929 Survey

Analysis of the amount of strip run on each unit is shown in Table II. From this table it is readily seen that too small a proportion of strip was run on some areas while others had possibly more than was necessary. At least 15 more man-days should be spent on the Wise River units, and it is felt that increasing the time spent on the Warm Springs, West Side, Rattlesnake, and Grasshopper units would be profitable. A new area, the Glendale unit, must be added to the survey project in 1930. It includes the drainages of Canyon, Trapper, Rock and Willow Creeks to the east of the Wise River units. Twelve man-days should be added to the estimated time for the project to properly cover the rough topography of this new unit. By reducing the amount of strip on the Mussigbrod and Pintlar units, increasing the amount on the ones previously mentioned, and adding 12 man-days for the new unit, it is believed a survey averaging at least 1.5 per cent of the total area will be secured. For a three-man crew it would mean increasing the effective time on the project to 141 days. In addition, a red-top survey should be made of the sources contributing to the Big Hole epidemic. This would require a trip along the Continental Divide taking possibly ten days to complete. It can most logically be made prior to the strip survey.

Table II

SUMMARY SHEET - BIG HOLE SURVEY - 1929

Name of Unit	Acres of Strip Run	Number of Attacked Trees	Acreage of Unit	Per Cent of Unit Surveyed
Pintlar	677.7	3,545	21,760	3.11
Musshogrod	582.9	3,506	20,450	2.85
Battlefield	759.9	3,404	37,120	2.05
West Side	317.1	1,423	33,250	0.95
Jackson	503.6	2,085	23,160	1.97
Bloody Dick	839.1	1,296	61,440	1.37
Horse Prairie	467.7	1,237	24,320	1.92
Rattlesnake	579.9	125	43,000	1.21
Grasshopper	503.3	39	41,600	1.21
Warm Springs	444.5	708	51,200	0.87
East Side	690.1	1,993	49,280	1.40
Upper Wise River	825.1	97	144,000	0.57
Lower Wise River	352.4	155	61,440	0.57
Totals	7,543.3	19,613	622,080	
Average				1.21 per cent